What is claimed is:

1. A torque sensor comprising:

a first shaft;

a second shaft;

an elastic member coupling said first shaft to said second shafts in alignment with each other, upon input of torque, said elastic member undergoing torsion;

a hard magnetic member joined to said first shaft, said hard magnetic member having magnetic poles arrayed on a periphery thereof to produce a magnetic field therearound;

an assembly of a first and a second soft magnetic member which is joined to said second shaft and placed around said hard magnetic member within the magnetic filed produced by said hard magnetic member to form a magnetic circuit so that upon a change in position of the first and second magnetic members relative to said hard magnetic member arising from the torsion of said elastic member, density of magnetic flux developed within the magnetic circuit changes; and

a magnetic sensor placed in non-contact with said first and second soft magnetic members, working to measure the density of magnetic flux within the magnetic circuit,

wherein said first and second soft magnetic members are opposed to each other through a given gap in a direction of the alignment of said first and second shafts, said first and second soft magnetic members having as many claws as the poles of said hard

magnetic member which are arrayed at regular intervals on peripheries of said first and second soft magnetic members, respectively, each of the claws of said first soft magnetic member being interposed between adjacent two of the claws of said second soft magnetic member, each of the claws having a base portion and a head portion to have substantially a trapezoidal shape, the base portion having a width A extending in a circumferential direction of said first and second soft magnetic members, the head portion having a width B extending in the circumferential direction which is smaller than the width A, the widths A and B being selected to meet relations below

$$0.6 \times F < L < 1.2 \times F$$

$$A < 0.5 \times P$$

$$B < 0.15 \times P$$

where F is a distance between said first and second soft magnetic members in the direction of the alignment of said first and second shafts, L is a length of each of the claws from the base portion to the head portion, and P is a distance between one of outer edges of each of the claws of the first soft magnetic member and one of outer edges of an adjacent one of the claws of the second magnetic member which lies on the same side as the first soft magnetic member in the circumferential direction of the first and second soft magnetic members.

2. A torque sensor as set forth in claim 1, further comprising auxiliary soft magnetic members which have magnetic flux collecting portions, respectively, which serve to collect the magnetic flux from said first and second soft magnetic members at said magnetic sensor.

3. A torque sensor as set forth in claim 1, wherein each of said first and second soft magnetic members has a ring-shaped flange to which the claws are affixed, the base portion of each of the claws extending from the ring-shaped flange, the head portion extending from the base portion.

4. A torque sensor as set forth in claim 1, wherein said magnetic sensor is disposed within the given gap between said first and second soft magnetic members to measure the density of magnetic flux flowing between said first and second soft magnetic members.

5. A torque sensor as set forth in claim 2, wherein the magnetic flux collecting portions of said auxiliary soft magnetic members are opposed to each other in the direction of alignment of said first and second shafts, and wherein said magnetic sensor is interposed between the magnetic flux collecting portions to measure the density of magnetic flux flowing between said first and second soft magnetic members through the magnetic flux collecting portions.

6. A torque sensor comprising:

a first shaft;

a second shaft;

an elastic member coupling said first shaft to said second shafts in alignment with each other, upon input of torque, said elastic member undergoing torsion;

a hard magnetic member joined to said first shaft, said hard magnetic member having magnetic poles arrayed on a periphery thereof to produce a magnetic field therearound;

an assembly of a first and a second soft magnetic member which is joined to said second shaft and placed around said hard magnetic member within the magnetic filed produced by said hard magnetic member to form a magnetic circuit so that upon a change in position of the first and second magnetic members relative to said hard magnetic member arising from the torsion of said elastic member, density of magnetic flux developed within the magnetic circuit changes; and

a magnetic sensor placed in non-contact with said first and second soft magnetic members, working to measure the density of magnetic flux within the magnetic circuit,

wherein said first and second soft magnetic members are opposed to each other through a given gap in a direction of the alignment of said first and second shafts, said first and second soft magnetic members having as many claws as the poles of said hard magnetic member which are arrayed at regular intervals on peripheries of said first and second soft magnetic members, respectively, each of the claws of said first soft magnetic member

being interposed between adjacent two of the claws of said second soft magnetic member, each of the claws having a base portion and a head portion, the base portion having a width *A* extending in a circumferential direction of said first and second soft magnetic members which is greater than a width of the head portion extending in the circumferential direction, the width *A* and a distance *P* between one of outer edges of each of the claws of the first soft magnetic member and one of outer edges of an adjacent one of the claws of the second magnetic member which lies on the same side as the first soft magnetic member in the circumferential direction of the first and second soft magnetic members meeting a relation below

$$0.5 \times P < A < P$$

7. A torque sensor as set forth in claim 1, further comprising an auxiliary soft magnetic member which has a magnetic flux collecting portion serving to collect the magnetic flux from said first and second soft magnetic members at said magnetic sensor.